WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
Coden USA: WJPRAP Impact Factor 8.453
Volume 14, Issue 21, 784-798. Research Article ISSN 2277–7105

PREVALENCE OF CORONARY ARTERY DISEASE IN PATIENTS WITH HYPERTENSION, DIABETES, AND HYPERLIPIDEMIA

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Article Received on 27 Sept. 2025,
Article Revised on 17 October 2025,
Article Published on 01 Nov. 2025,

https://www.doi.org/10.5281/zenodo.17472215

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How to cite this Article: Vijetha Pokkula1*, Srivani Gajavelli1, Santhosh Modani2, M Shiva Rama Krishna1 (2025). PREVALENCE OF CORONARY ARTERY DISEASE IN PATIENTS WITH HYPERTENSION, DIABETES, AND HYPERLIPIDEMIA World Journal of Pharmaceutical Research, 14(21), 784–798.
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ABSTRACT

Background: Coronary artery disease (CAD) is the leading global cause of death, with a rising burden in India due to modifiable risk factors like hypertension, diabetes, and dyslipidaemia. **Objective:** To assess coronary artery disease prevalence and its association with common risk factors among patients at tertiary care centers in Warangal, Telangana. **Methods:** A prospective, observational study was conducted between December 2021 and May 2022 at Ekashila Hospital and Santhosh Cardiac Care Centre. Adults aged ≥25 years with hypertension, diabetes, and/or hyperlipidemia were included. Data on demographics, blood pressure, lipid profiles, and coronary artery disease diagnosis (via angiography or clinical report) were collected and analyzed using descriptive statistics and t-tests (GraphPad Prism v9.4.0). **Results:** Of 200 participants, 66% were male, and the mean age was 46 ± 8 years. Hypertension (76.5%), diabetes (51%), and low HDL (73.5%) were the most prevalent risk factors. Coronary artery disease was confirmed in 78% of participants, with a higher prevalence in males (86.4%) and older adults (46–60 years). Mean systolic and diastolic pressures (129.8/81.8 mmHg) and HDL levels (35.16 mg/dL) were significantly outside optimal ranges ($p < 0.0001$). LDL and total cholesterol levels were within or near desirable limits in most individuals. **Conclusion:** The study revealed a high prevalence of coronary artery disease among older adults and

males, primarily associated with hypertension, diabetes, and low HDL cholesterol. Targeted screening and early lifestyle and pharmacological interventions are essential to mitigate Coronary artery disease risk and improve cardiovascular outcomes in high-risk populations.

KEYWORDS: Coronary artery disease; Hypertension; Diabetes mellitus; Hyperlipidemia; Prevalence.

INTRODUCTION

Coronary artery disease (CAD) remains the leading cause of mortality worldwide, significantly contributing to the overall burden of cardiovascular diseases (CVDs).[1,2] As reported by the World Health Organization (WHO), an estimated 17.9 million people died from CVDs in 2019, making up nearly one-third of all deaths globally. Alarmingly, over 75% of these deaths occurred in low- and middle-income countries, highlighting significant disparities in healthcare access, preventive strategies, and disease management.[3] Projections indicate that by the year 2030, cardiovascular diseases may be responsible for as many as 25 million deaths annually.[4]

Among the various forms of CVD, coronary artery disease stands out as the most critical, often progressing silently over several years without noticeable symptoms. This asymptomatic nature means many individuals remain unaware of the underlying disease until a sudden and potentially fatal event occurs, such as myocardial infarction (heart attack) or sudden cardiac death.[5] CAD, as a form of ischemic heart disease, develops primarily due to atherosclerosis—a condition characterized by chronic inflammation and the gradual build-up of cholesterol-rich plaques within the inner walls of the coronary arteries. Over time, these plaques narrow the arteries, restrict blood flow to the heart, and may eventually rupture, triggering the formation of blood clots that can completely block arteries.[6]

Atherosclerosis begins with endothelial dysfunction, followed by the accumulation of lipids and the formation of fibrous plaques.[7–9] As these plaques grow and become unstable, they can rupture or erode, leading to thrombus (clot) formation. This process may result in the partial or complete blockage of blood flow in coronary arteries, often culminating in acute cardiovascular events such as heart attacks, stroke, or sudden cardiac arrest.[10,11] In imaging studies, such as coronary artery calcium scoring, this process is visible as calcified lesions along the coronary vessel walls—an indicator of advanced atherosclerosis.

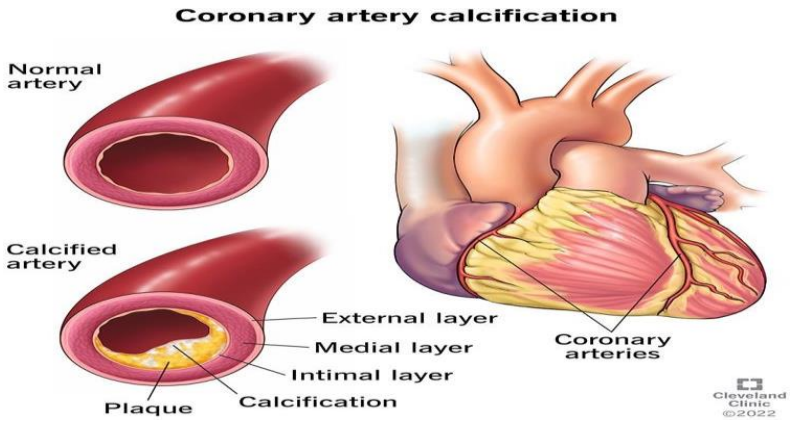

Fig. 1: Coronary artery calcification.

In the Indian context, CAD poses a major public health challenge. According to data from the Million Death Study (2009), cardiovascular disease was the leading cause of death among adults aged 25 to 69 years, accounting for 20.3% of male deaths and 16.9% of female deaths in this age group.[13] Over the past several decades, the prevalence of ischemic heart disease in India has surged, particularly in urban regions. While the prevalence was only about 2% in the 1960s, it has since increased more than sevenfold, reflecting changes in lifestyle, urbanization, dietary patterns, and other risk factors.[14]

Across the globe, the prevalence and trends of CAD vary significantly, even among populations living in the same region. Findings from the INTERHEART study, a large international case-control study, confirmed that several modifiable risk factors play a dominant role in the development of myocardial infarction. These include unhealthy lipid profiles, hypertension, diabetes mellitus, central obesity, smoking, stress, poor dietary habits, physical inactivity, and alcohol consumption.[15] The consistent presence of these risk factors across diverse populations underscores the global nature of CAD and the need for universal prevention strategies.

In India, rural and urban populations exhibit different risk patterns. Rural regions report a CAD prevalence of approximately 1.7% in men and 1.5% in women.[16] while urban areas show markedly higher levels of hypertension, obesity, diabetes, and physical inactivity. However, tobacco use remains more common in rural areas, and alcohol consumption appears to be similar across both populations.[17] Notably, the prevalence of diabetes in urban India has nearly doubled over the past two decades—from 9% to 17%—while rural areas have experienced a fourfold increase, from 2% to 9%.[18] Likewise, hypertension affects around 30% of adults nationally, with slightly higher rates in urban settings (34%) compared

to rural areas (28%).[19]

While CAD is a chronic condition with potentially fatal consequences, its prognosis can be significantly improved through secondary prevention strategies. These include lifestyle modifications such as quitting smoking, maintaining a healthy diet, engaging in regular physical activity, and reducing stress. In addition, medical interventions—including the use of antiplatelet agents, statins, antihypertensives, and blood sugar control medications—play a crucial role in mitigating further progression of disease and preventing acute events.[20] Globally, some nations have successfully reduced their CAD burden through comprehensive health education, public awareness campaigns, dietary improvements, and tobacco control policies. This progress highlights the importance of community-specific interventions, tailored to address regional risk profiles and healthcare challenges. For countries like India, with a large and diverse population, targeted prevention programs that account for urban-rural differences, socioeconomic status, and lifestyle habits are essential to curb the rising tide of CAD.[21,22]

MATERIALS AND METHODS

Study design and setting: This prospective, observational study was conducted at Ekashila Hospital and Santhosh Cardiac Care Centre, Warangal, Telangana, between December 2021 and May 2022.

Participants: Consecutive adults (≥25 years) with documented hypertension, DM and/or hyper lipidaemia were included. Patients <25 years or free of these comorbidities were excluded.

Data collection: Demographic details, blood‑pressure readings, fasting lipid profile, and CAD status confirmed by coronary angiography or cardiologist report were abstracted into a Microsoft Excel database.

Statistical analysis: Continuous variables are expressed as mean ± standard deviation (SD); categorical variables as frequencies (%). A one‑sample t‑test compared observed means with standard guideline targets. P‑values <0.05 denoted statistical significance (GraphPad Prism v9.4.0).

RESULTS

Demographics

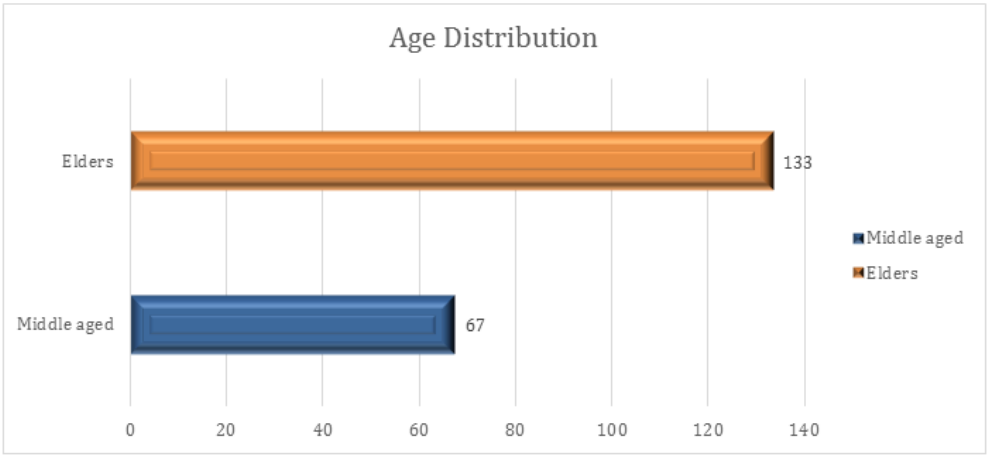

Figure 2: Age Distribution in the study sample.

Age in group (years)	No. of patients	Percentage (%)
Middle-aged (25-45)	67	33
Elders (46-79)	133	67
Total	200	100

The bar graph illustrates the age distribution of the study population, with 67 participants classified as middle-aged and 133 as elderly, indicating a predominance of older individuals. Given that CAD risk increases with age, this demographic pattern may have influenced the observed prevalence rates, rendering the findings more representative of older age groups.

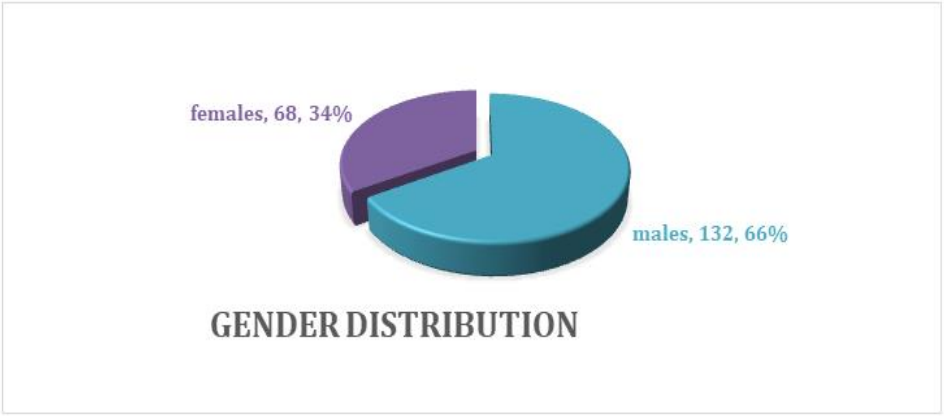

Figure 3: Gender distribution in the study sample.

Gender	No. of patients	Percentage (%)
Male	132	66
Female	68	34
Total	200	100

The pie chart visually represents the gender distribution among 200 study participants. It shows that 66% (132 participants) were male, while 34% (68 participants) were female, indicating a higher proportion of males in the study population.

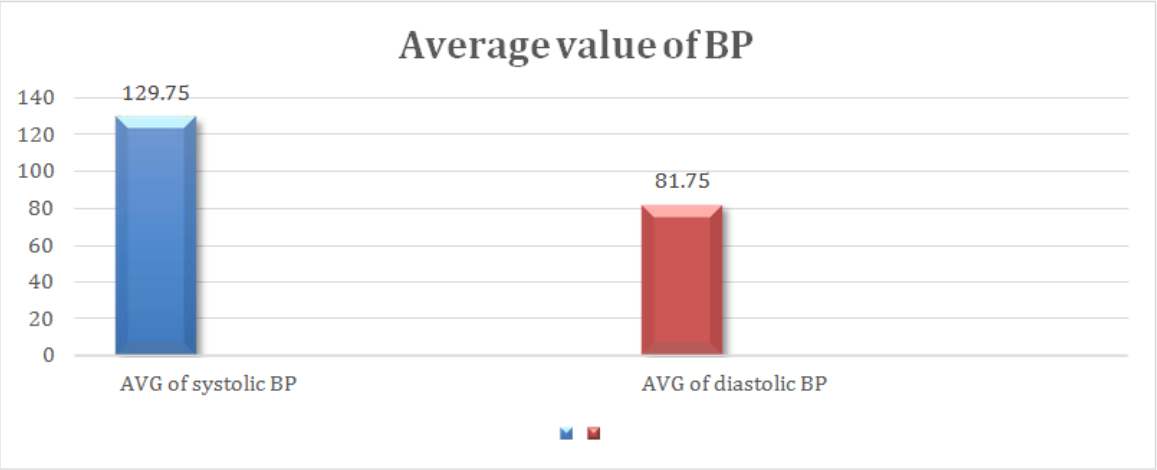

Figure 4: Average value of both systolic and diastolic BP.

Average value of SBP (mmHg)	Average value of DBP (mmHg)
129.75	81.75

Blood pressure: Average systolic and diastolic pressures were 129.8 ± 11.9 mmHg and 81.8 ± 8.7 mmHg, respectively, significantly above optimal thresholds ($p < 0.0001$).

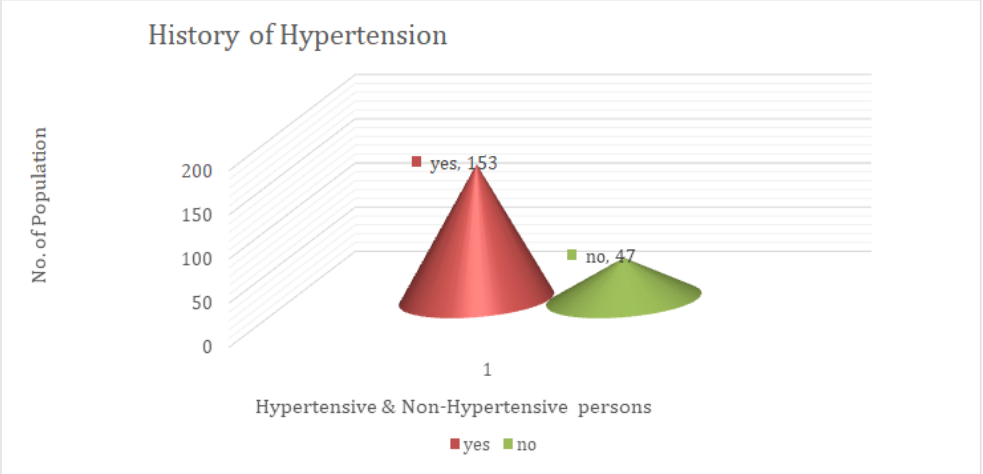

Figure 5: Hypertensive vs non-hypertensive subjects in the sample study.

Type of patients	No. of patients	Percentage (%)
Hypertensive	153	76.5%
Non-Hypertensive	47	23.5%
Total	200	100

The bar graph depicts the distribution of hypertensive and non-hypertensive subjects in the study population. Over three-fourths were hypertensive, indicating a high prevalence of elevated blood pressure, a major risk factor for heart disease.

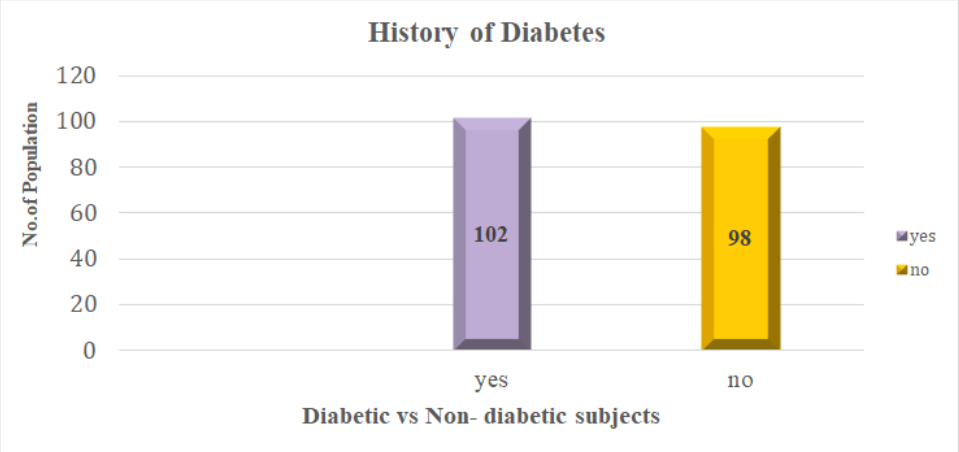

Figure 6: Diabetic vs non-diabetic subjects in the sample study.

Type of patients	No. of patients	Percentage (%)
Diabetic	102	51%
Non-Diabetic	98	49%
Total	200	100

The bar graph illustrates the prevalence of major cardiovascular risk factors among the study population. Notably, diabetes mellitus (DM) was present in 102 participants (51%), indicating that half of the population was affected. This is clinically significant, as diabetes is a major contributor to vascular damage and a known accelerator of coronary artery disease (CAD).

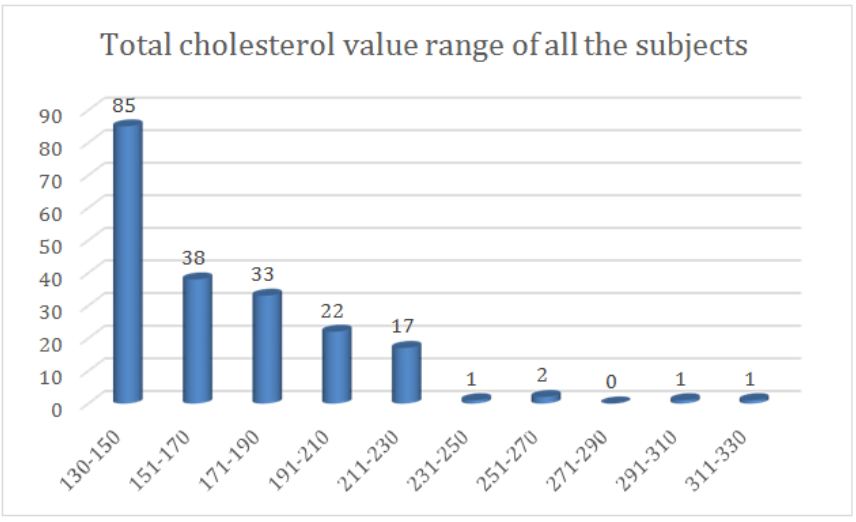

Figure 7: Total cholesterol value range of all the subjects.

Cholesterol Range	No. of patients	Percentage (%)
130-150	85	42.5
151-170	38	19.0
171-190	33	16.5
191-210	22	11.0
211-230	17	8.5
231-250	1	0.5
251-270	2	1.0
271-290	0	0.0
291-310	1	0.5
311-330	1	0.5
Total	200	100

The bar graph presents the prevalence of various cardiovascular risk factors among the study participants. While conditions like hypertension (76.5%), low HDL-C (73.5%), and diabetes (51%) were highly prevalent, a smaller portion of the population—15.5% (31 participants)—had high total cholesterol levels (>200 mg/dL).

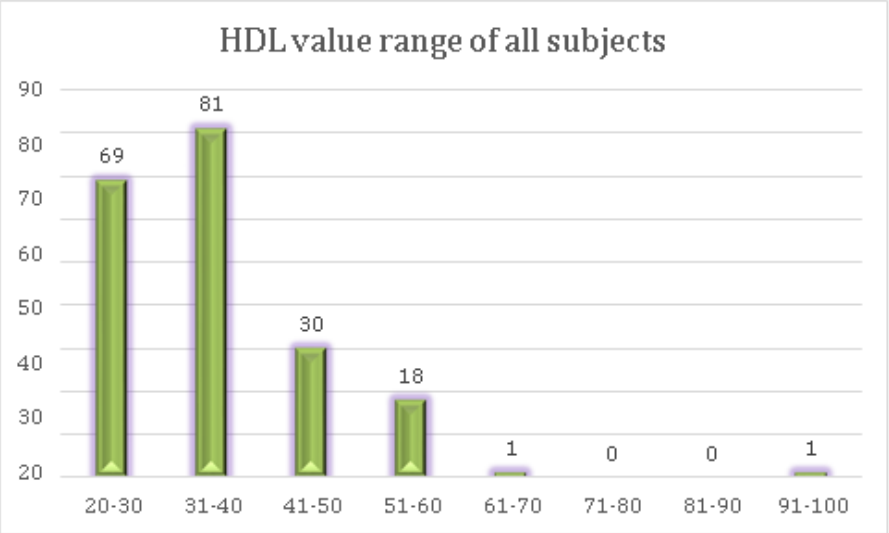

Figure 8: HDL value range of all the subjects in the sample study.

HDL Range	No. of Patients	Percentage (%)
20-30	69	34.5
31-40	81	40.5
41-50	30	15.0
51-60	18	9.0
61-70	1	0.5
71-80	0	0.0
81-90	0	0.0
91-100	1	0.5
Total	200	100

The bar graph highlights the prevalence of key cardiovascular risk factors among the study participants. A striking observation is that 147 out of 200 individuals (73.5%) had low high-density lipoprotein cholesterol (HDL-C) — commonly referred to as "good cholesterol." This means that nearly three-quarters of the study population had HDL-C levels below the recommended range.

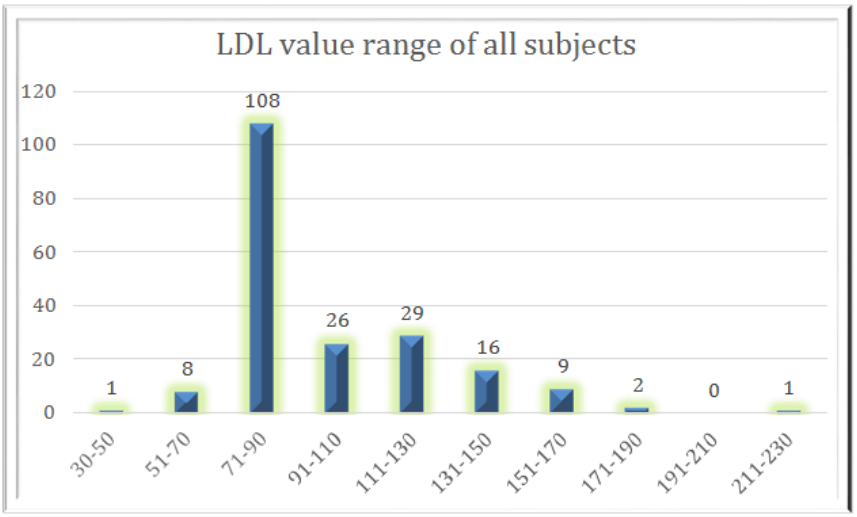

Figure 9: LDL value range of all the subjects in the sample study.

LDL Range	No. of patients	Percentage (%)
30-50	1	0.5
51-70	8	4.0
71-90	108	54.0
91-110	26	13.0
111-130	29	14.5
131-150	16	8.0
151-170	9	4.5
171-190	2	1.0
191-210	0	0.0
211-230	1	0.5
Total	200	100

The bar graph illustrates the distribution of key cardiovascular risk factors among the study participants. One notable finding is that 71 individuals (35.5%) had elevated low-density lipoprotein cholesterol (LDL-C >100 mg/dL) — often referred to as "bad cholesterol." This means that approximately one-third of the population had LDL-C levels above the recommended threshold.

Figure 10: The average range of total cholesterol, HDL and LDL of all the subjects in the sample study.

Parameter	Normal/ Optimal	Borderline	High/Low risk	Very high risk	Average
Total cholesterol (mg/dl)	< 200	200-239	≥240 (High)	-	166.39
HDL (mg/dl)	≥ 60 (protective)	40-59 (Normal)	<40(Low)	-	35.16
LDL (mg/dl)	< 100 (Optimal)	130-159 (Borderline)	160-189(High)	≥ 190(very high)	97.35

Total Cholesterol: 166.39 mg/dL – within normal limits (desirable: <200 mg/dL). HDL (High-Density Lipoprotein): 35.16 mg/dL – low, indicating reduced protection against heart disease (ideal: >40 mg/dL for men, >50 mg/dL for women). LDL (Low-Density Lipoprotein): 97.35 mg/dL – close to optimal (<100 mg/dL), but in a high-risk population, even lower targets are recommended.

CAD prevalence: Overall, 156 individuals (78 %) identified using angiography or clinically confirmed CAD. Prevalence was higher in males (86.4 %) than in females (61.8 %). The risk of CAD increases with age, i.e., Older adults are more likely to have CAD than younger adults between 25–45 years old.

Total population (n= 200)	Males (n=132)	Females (n=68)
evalence n (%) 156 (78%)	114 (86.4%)	42 (61.8%)

DISCUSSION

Coronary artery disease (CAD) is currently the top cause of death worldwide.[23] It often develops slowly over time and may not show symptoms until a serious event occurs.[24] This study was carried out at Ekashila Hospital and Santosh Cardiac Care Centre to explore how common risk factors like high blood pressure, diabetes, and abnormal cholesterol levels are linked to CAD. We also examined how these factors vary by age and gender, particularly in younger individuals.

Our study was prospective and observational. Most participants were men (66%) compared to women (34%). Lippi G et al. state that higher heart disease rates are observed in women (14.8%) than in men (9.8%).[25] In contrast, our results showed the opposite: more men (48.5%) were affected than women (24.5%).

Bauersachs R, et al., Hosseini K, et al. Ralapanawana U, et al., studies states that These researches has reported risk factor rates like diabetes (15.2%), high blood pressure (28.4%), high cholesterol (52.3%), and smoking in men (28.1%).[26,27,28] In our study, these rates were higher: hypertension (76.5%), diabetes (51%), low HDL (73.5%), high LDL (35.5%), and total cholesterol (15.5%). Krishnan MN, et al.-2016 Mohan V, et al.-2001 shows that hypertension, diabetes, and low HDL levels are more strongly associated with CAD which is similar to our study, though all findings were statistically significant.[29,30]

Aggarwal A, et al- Kumar S, et al. states that CAD in people younger than 45 is called early or young CAD. This is rare globally (1.2%) but more common in South Asians, including Indians (5–10%).[31,32] However, in our data, older adults had more CAD, although among the younger group, women were more affected than men.

Srihari Babu M.Krishnan A, et al.- studies show that an estimated CAD prevalence at around 11%,[33,34] our study showed a much higher rate of 78%, which could be due to the limited number of participants. Both our findings and Libby P et al., McGill Hav Jr., et al.- showed no strong connection between smoking and CAD, possibly due to sample size limitations.[11,35]

Nayeri DN, et al. Mahmood D, et al. Wong ND.- stress that early health checkups and lifestyle changes (diet, exercise, awareness) can help prevent or reduce CAD risk [36,37,38]. We followed the same approach by offering participants advice on heart health, risk factor

control, and lifestyle changes.

Our prospective observational study at Ekashila Hospital and Santosh Cardiac Care Centre examined the prevalence of common risk factors for coronary artery disease (CAD) among participants, most of whom were men (66%). We found high rates of hypertension (76.5%), diabetes (51%), low HDL cholesterol (73.5%), high LDL cholesterol (35.5%), and elevated total cholesterol (15.5%). The overall CAD prevalence in our study was 78%, with older adults being more affected, although younger women showed higher rates than younger men. Smoking did not show a strong association with CAD in our sample, possibly due to the limited number of participants. Lifestyle modification advice was provided to all participants to help reduce their future CAD risk.

Limitations: This study was done in a hospital with a small number of patients, so the results might not apply to the general population. Smoking status and psychosocial stressors were not systematically quantified. Following patients over a longer time could help us better understand how controlling risk factors affects heart disease.

CONCLUSION

The study demonstrated a higher prevalence of coronary artery disease (CAD) and associated risk factors—such as hypertension, diabetes, and dyslipidemia—among older adults compared to younger individuals. This suggests that advancing age significantly contributes to the cumulative burden of cardiovascular risk. Early identification and effective management of these risk factors through evidence-based medical therapy and sustained lifestyle interventions—such as dietary modifications, regular physical activity, smoking cessation, and stress reduction—can play a critical role in the prevention and progression of CAD.

Conflict of Interest

None declared.

Ethics Approval

Approved by the Institutional Ethics Committee, Balaji Institute of Pharmaceutical Sciences (BIPS/IEC/2021/P7).

Consent to Participate

Written informed consent was obtained from all participants.

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